

Linear Products

Product Specification

DESCRIPTION

The UC1842 family of control ICs provides in an 8-Pin mini-DIP the necessary features to implement off-line, fixed-frequency current-mode control schemes with a minimal external parts count. This technique results in improved line regulation, enhanced load response characteristics, and a simpler, easier to design control loop. Topological advantages include inherent pulse-by-pulse current limiting.

Protection circuitry includes built-in undervoltage lock-out and current limiting. Other features include fully-latched operation, a 1% trimmed bandgap reference, and start-up current less than 1mA.

These devices feature a totem-pole output designed to source and sink high peak current from a capacitive load, such as the gate of a power MOSFET. Consistent with N-channel power devices, the output is low in the OFF-state.

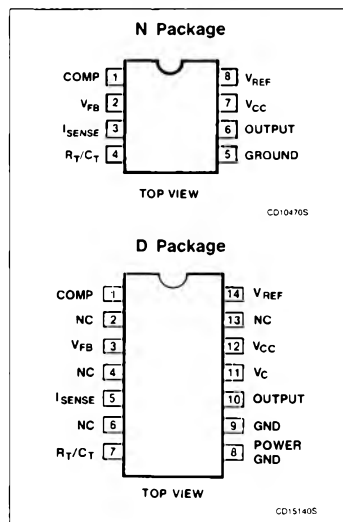
FEATURES

- Low start-up current ($\leq 1\text{mA}$)
- Automatic feed-forward compensation
- Pulse-by-pulse current limiting
- Enhanced load response characteristics
- Undervoltage lock-out with hysteresis
- Double pulse suppression
- High current totem-pole output
- Internally-trimmed bandgap reference
- 400kHz operation, guaranteed min

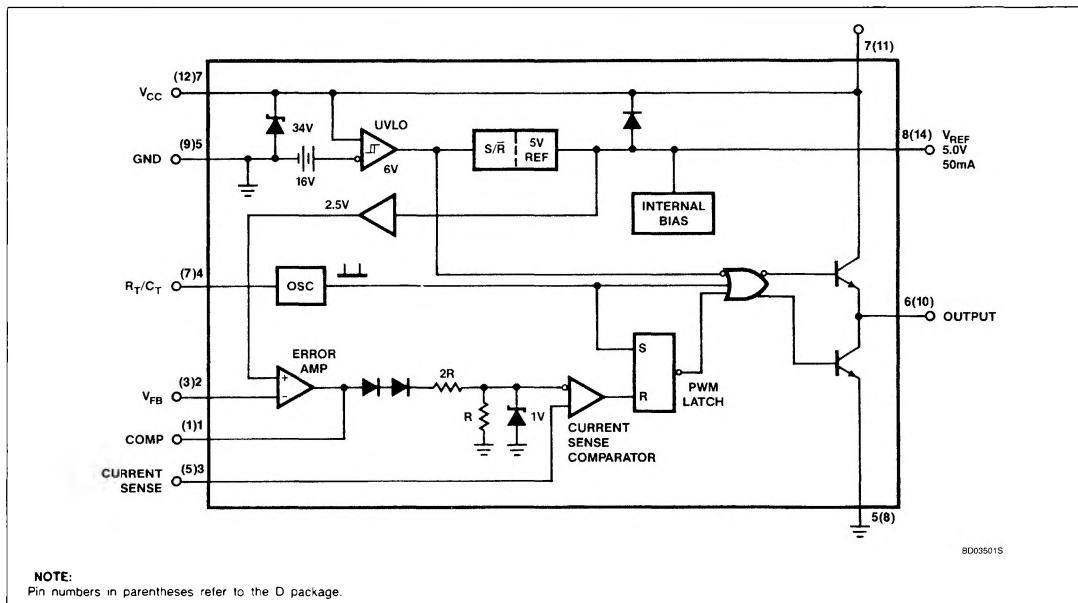
APPLICATIONS

- Off-line switched mode power supplies
- DC-to-DC converters

PIN CONFIGURATIONS



BLOCK DIAGRAM



Current-Mode PWM Controller

UC1842, UC2842, UC3842

ORDERING INFORMATION

DESCRIPTION	TEMPERATURE RANGE	ORDER CODE
8-Pin Plastic DIP	0 to +70°C	UC3842N
14-Pin Plastic SO	0 to +70°C	UC3842D
8-Pin Plastic DIP	-40 to +85°C	UC2842N
14-Pin Plastic SO	-40 to +85°C	UC2842D
8-Pin Plastic DIP	-55 to +125°C	UC1842N

ABSOLUTE MAXIMUM RATINGS¹

SYMBOL	PARAMETER	RATING	UNIT
V _{CC}	Supply voltage (I _{CC} < 30mA)		Self-Limiting
V _{CC}	Supply voltage (low impedance source)	30	V
I _{OUT}	Output current ^{2, 3}	± 1	A
	Output energy (capacitive load)	5	μJ
	Analog inputs (Pin 2, Pin 3)	-0.3 to 6.3	V
	Error amp output sink current	10	mA
P _D	Power dissipation at T _A ≤ 70°C (derate 12.5mW/°C for T _A > 70°C) ²	1	W
T _{STG}	Storage temperature range	-65°C to +150	°C
T _{SOLD}	Lead temperature (soldering, 10sec max)	300	°C

NOTES:

1. All voltages are with respect to Pin 5; all currents are positive into the specified terminal.
2. See section in application note on "Power Dissipation Calculation".
3. This parameter is guaranteed, but not 100% tested in production.

Current-Mode PWM Controller

UC1842, UC2842, UC3842

DC AND AC ELECTRICAL CHARACTERISTICS (Unless otherwise stated, these specifications apply for
 $-55 \leq T_J \leq 125^\circ\text{C}$ for UC1842/43; $-25 \leq T_J \leq 85^\circ\text{C}$ for UC2842/43;
 $0 \leq T_J \leq 70^\circ\text{C}$ for UC3842/43; $V_{CC} = 15^4$; $R_T = 10\text{k}\Omega$; $C_T = 3.3\text{nF}$.)

SYMBOL	PARAMETER	TEST CONDITIONS	UC1842 UC2842			UC3842			UNIT
			Min	Typ	Max	Min	Typ	Max	
Reference section									
V_{OUT}	Output voltage	$T_J = 25^\circ\text{C}$, $I_O = 1\text{mA}$	4.95	5.00	5.05	4.90	5.00	5.10	V
	Line regulation	$12 \leq V_{IN} \leq 25\text{V}$		6	20		6	20	mV
	Load regulation	$1 \leq I_O \leq 20\text{mA}$		6	25		6	25	mV
	Temp. stability ¹			0.2	0.4		0.2	0.4	mV/ $^\circ\text{C}$
	Total output variation ¹	Line, load, temp.	4.90		5.10	4.82		5.18	V
V_{NOISE}	Output noise voltage ¹	$10\text{Hz} \leq f \leq 10\text{kHz}$, $T_J = 25^\circ\text{C}$		50			50		μV
	Long-term stability ¹	$T_J = 125^\circ\text{C}$, 1000 Hrs.		5	25		5	25	mV
	Output short-circuit	$T_J = 25^\circ\text{C}$	-30	-100	-130	-30	-100	-130	mA
	Output short-circuit	$-55 < T_J \leq 0^\circ\text{C}$	-30	-100	-180	-30	-100	-180	mA
Oscillator section									
	Initial accuracy	$T_J = 25^\circ\text{C}$	47	52	57	47	52	57	kHz
	Voltage stability	$12 \leq V_{CC} \leq 25\text{V}$		0.2	1		0.2	1	%
	Temp. stability ¹	$T_{MIN} \leq T_J \leq T_{MAX}$		5			5		%
	Amplitude	$V_{PIN 4}$ peak-to-peak		1.7			1.7		V
Error amp section									
	Input voltage	V Pin 1 = 2.5V	2.45	2.50	2.55	2.42	2.50	2.58	V
I_{BIAS}	Input bias current			-0.3	-1		-0.3	-2	μA
A_{VOL}		$2 \leq V_O \leq 4\text{V}$	65	90		65	90		dB
	Unity gain bandwidth ¹	$T_J = 25^\circ\text{C}$	0.7	1		0.7	1		MHz
	Unity gain bandwidth	$T_{MIN} < T_J < T_{MAX}$	0.5			0.5			MHz
PSRR	Power supply rejection ratio	$12 \leq V_{CC} \leq 25\text{V}$	60	70		60	70		dB
I_{SINK}	Output sink current	$V_{PIN 2} = 2.7\text{V}$, $V_{PIN 1} = 1.1\text{V}$	2	6		2	6		mA
I_{SOURCE}	Output source current	$V_{PIN 2} = 2.3\text{V}$, $V_{PIN 1} = 5\text{V}$	-0.5	-0.8		-0.5	-0.8		mA
	V_{OUT} High	$V_{PIN 2} = 2.3\text{V}$, $R_L = 15\text{k}$ to ground	5	6		5	6		V
	V_{OUT} Low	$V_{PIN 2} = 2.7\text{V}$, $R_L = 15\text{k}$ to Pin 8		0.7	1.1		0.7	1.1	V
Current sense section									
	Gain ^{2, 3}		2.85	3	3.15	2.85	3	3.15	V/V
	Maximum input signal ²	$V_{PIN 1} = 5\text{V}$	0.9	1	1.1	0.9	1	1.1	V
PSRR	Power supply rejection ratio ²	$12 \leq V_{CC} \leq 25\text{V}$		70			70		dB
I_{BIAS}	Input bias current			-2	-10		-2	-10	μA
	Delay to output ¹			150	300		150	300	ns

Current-Mode PWM Controller

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DC AND AC ELECTRICAL CHARACTERISTICS (Continued) (Unless otherwise stated, these specifications apply for $-55 \leq T_J \leq 125^\circ\text{C}$ for UC1842/43; $-25 \leq T_J \leq 85^\circ\text{C}$ for UC2842/43; $0 \leq T_J \leq 70^\circ\text{C}$ for UC3842/43; $V_{CC} = 15\text{V}^4$; $R_T = 10\text{k}\Omega$; $C_T = 3.3\text{nF}$.)

SYMBOL	PARAMETER	TEST CONDITIONS	UC1842/43 UC2842/43			UC3842/43			UNIT
			Min	Typ	Max	Min	Typ	Max	
Output section									
I _{OL}	Output Low-Level	I _{SINK} = 20mA		0.1	0.4		0.1	0.4	V
		I _{SINK} = 200mA		1.5	2.2		1.5	2.2	V
I _{OH}	Output High-Level	I _{SOURCE} = 20mA	13	13.5		13	13.5		V
		I _{SOURCE} = 200mA	12	13.5		12	13.5		V
t _R	Rise time	C _L = 1nF		50	150		50	150	ns
t _F	Fall time	C _L = 1nF		50	150		50	150	ns
Undervoltage lockout section									
	Start threshold	X842	15	16	17	14.5	16	17.5	V
		X843	7.8	8.4	9.0	7.8	8.4	9.0	V
	Min. operating voltage after turn on	X842	9	10	11	8.5	10	11.5	V
		X843	7.0	7.6	8.2	7.0	7.6	8.2	V
PWM section									
	Maximum duty cycle	X842/43	93	97	100	93	97	100	%
	Minimum duty cycle				0			0	%
Total standby current									
	Start-up current			0.5	1		0.5	1	mA
I _{CC}	Operating supply current	V _{PIN 2} = V _{PIN 3} = 0V		11	17		11	17	mA
	V _{CC} zener voltage	I _{CC} = 25mA		34			34		V
Maximum operating frequency section									
	Maximum operating frequency for all functions operating cycle-by-cycle		400			400			kHz

NOTES:

1. These parameters, although guaranteed, are not 100% tested in production.

2. Parameter measured at trip point of latch with V_{PIN 2} = 0.

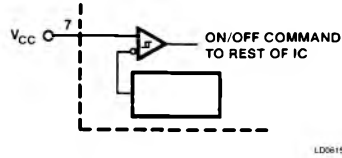
3. Gain defined as:

$$A = \frac{\Delta V_{PIN 1}}{\Delta V_{PIN 3}}; 0 \leq V_{PIN 3} \leq 0.8\text{V}.$$

Current-Mode PWM Controller

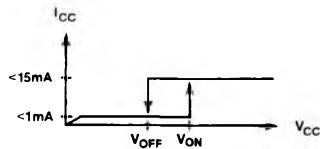
UC1842, UC2842, UC3842

UNDERVOLTAGE LOCKOUT



LD06152S

	UC1842
V _{ON}	16V
V _{OFF}	10V

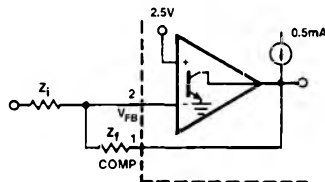


LD06153S

NOTE:

During Undervoltage Lock-Out, the output driver is biased to a high impedance state. Pin 6 should be shunted to ground with a bleeder resistor to prevent activating the power switch with output leakage current.

ERROR AMP CONFIGURATION



LD06161S

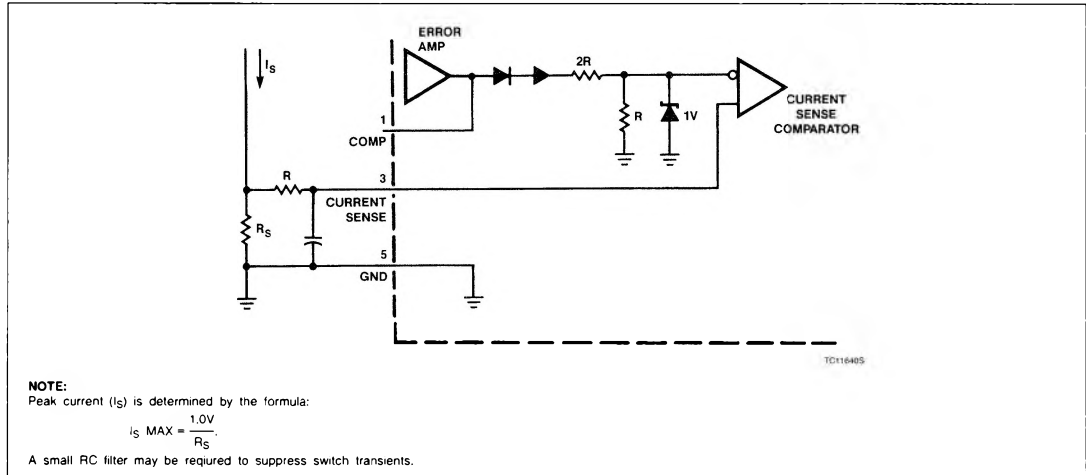
NOTE:

Error AMP can source or sink up to 0.5mA.

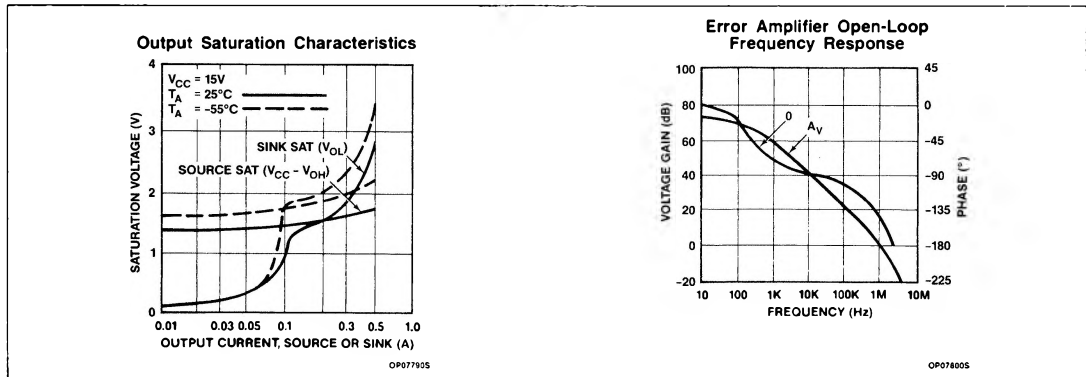
Current-Mode PWM Controller

UC1842, UC2842, UC3842

CURRENT SENSE CIRCUIT



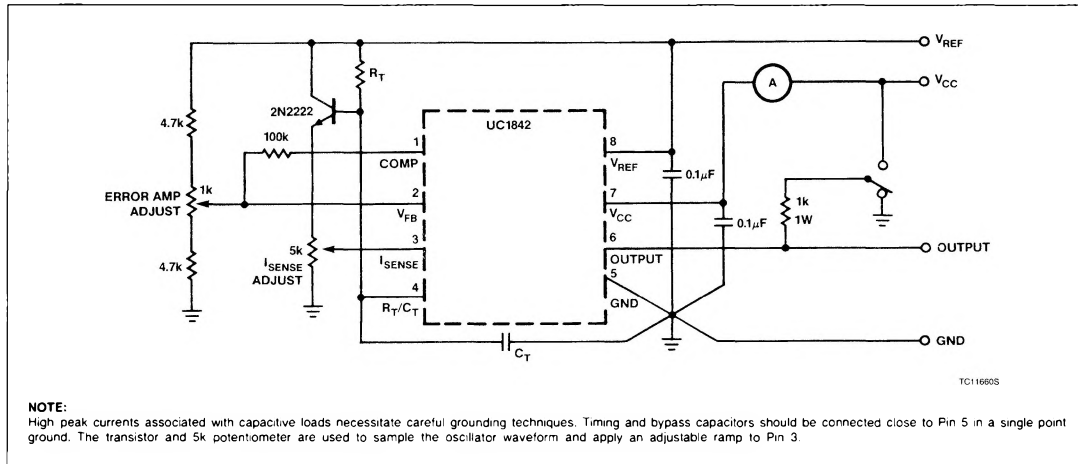
TYPICAL PERFORMANCE CHARACTERISTICS



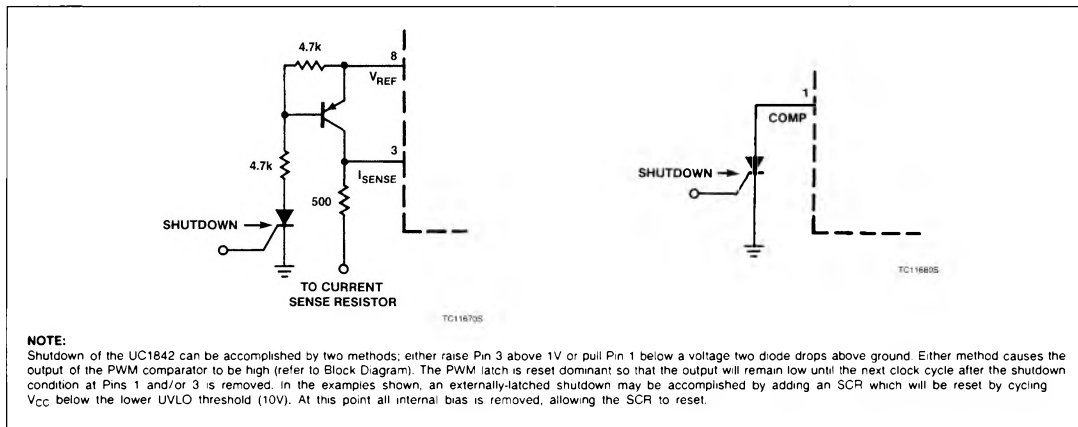
Current-Mode PWM Controller

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OPEN-LOOP LABORATORY TEST FIXTURE



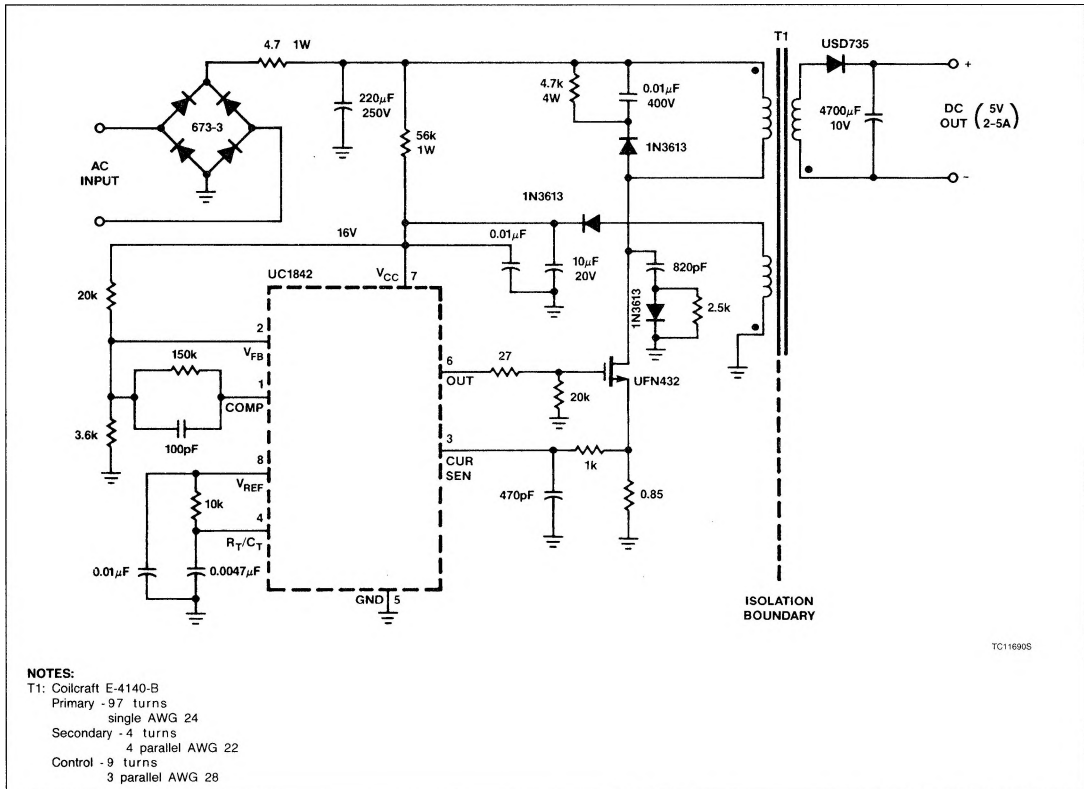
SHUTDOWN TECHNIQUES



Current-Mode PWM Controller

UC1842, UC2842, UC3842

OFF-LINE FLYBACK REGULATOR



TC11690S

SPECIFICATIONS

Input line voltage:	90V _{AC} to 130V _{AC}
Input frequency:	50 or 60Hz
Switching frequency:	40kHz ± 10%
Output power:	25W maximum
Output voltage:	5V ± 5%
Output current:	2 to 5A
Line regulation:	0.01%/V
Load regulation:	8%/A

Efficiency @ 25 W,

V _{IN} = 90V _{AC} :	70%
V _{IN} = 130V _{AC} :	65%

Output short-circuit current: 2.5A average

NOTE:

This circuit uses a low-cost feedback scheme in which the DC voltage developed from the primary-side control winding is sensed by the UC1842 error amplifier. Load regulation is therefore dependent on the coupling between secondary and control windings, and on transformer leakage inductance. For applications requiring better load regulation, a UC1901 Isolated Feedback Generator can be used to directly sense the output voltage.

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SYNCHRONIZATION AND MAXIMUM DUTY CYCLE CLAMP

